 DOI:https://doi.org/10.52206/jsmc.2022.12.4.635 OPEN ACCESS

Comparison of Single Plate Transbuccal Fixation with Intraoral External Oblique Ridge Fixation in Mandibular Angle Fractures.

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ABSTRACT

Background: Mandibular angle fractures are treated by many open reduction and fixation techniques. Each technique has several advantages and disadvantages. The external oblique ridge fixation via introral approach versus transbuccal fixation and intraoral approach together (combined approach) were compared in this study.

Objective: To compare the clinical outcomes of intraoral external oblique ridge fixation vs an intraoral transbuccal technique. A single miniplate fixation for the therapy of mandibular angle fractures.

Material and Methods: A total of 180 angle fracture patients were randomly assigned to one of two experimental groups in this randomized control trial. Each group had 80 patients: group A (single plate fixation intraoral only) and group B (single plate fixation intraoral plus transbuccal technique). On the first week, first month, and third month, all of the patients were followed up on to assess infection and malocclusion.

Results: With an age range of 16 to 60 years, the average age of the 160 patients was 24.79 years (SD 6.855). At the end of three months, 12 (15%) of patients in group A and 7 (8.75%) of patients in group B had infection. At the last follow-up appointment, 2 (2.5%) patients in group A and 1 (1.25%) patients in group B both had malocclusion (03 months post-op). At the third month after using the Chi square test, the P-value for infection and malocclusion was negligible.

Conclusion: The present study concluded that combination method (introral with transbuccal) can effectively treat mandibular angle fractures because it allows for easier plate adaption and placement of the plate in the mid neutral area, which reduces the risk of infection and malocclusion.

Keywords: Mandibular angle fractures, open reduction and internal fixation, Miniplates

This article may be cited as: Tayyab TF, Jamal M, Qayyum Z, Amin S, Riaz S, Perveen A. Comparison of Single Plate Transbuccal Fixation with Intraoral External Oblique Ridge Fixation in Mandibular Angle Fractures. J Saidu Med Coll Swat 2022;12(4):155-60.

INTRODUCTION

The facial bones, like the rest of the body's bones, are susceptible to injury. Due to its prominent position in the face, the mandible, a horseshoe-shaped bone that forms the lower jaw, is prone to fractures.[1]

The condyle, ramus, angle, body, and symphysis of the mandible can all be fractured. Mandibular angle fractures occur twice as frequently as mid-facial fractures.[2,3] Mandibular fractures can result in the loss of key functions such as mastication and swallowing, as well as the loss of the airway.[4] In the maxillofacial region, mandibular angle fractures account for 23-42% of all mandibular fractures. Many factors influence the angle fracture pattern, including the biomechanical intrinsic properties of the mandible, such as bone density, mass, and soft tissue bulk, as well as the direction and degree of the impact. In the same way, impacted wisdom teeth raise the chance of a mandibular angle fracture.[5-8]

Road traffic accidents, falls, assaults, falls, and sports injuries are all common causes of fractures.[9] The complication rate for a mandibular angle fracture ranges from 0% to 32%.[5,6]

Post-operative complications (0-30%) are a danger with mandibular angle fractures, making them difficult to treat.[10] The best surgical treatment for mandibular angle fractures remains a point of contention. Close reduction and immobilization with IMF, open reduction with non-rigid fixation, semi-rigid, and rigid fixation are all surgical options for treating mandibular angle fractures.[11] However, open reduction and internal fixation have various advantages, including shorter hospital stays, higher patient satisfaction because IMF is avoided, resulting in early mandibular function, and early return to work.

For mandibular angle fractures, there are many open reduction and internal fixation procedures. Champy et al. advised using a single miniplate at the external oblique ridge, i.e. in the stress zone, via an intraoral approach exclusively; this technique is known as Champy's technique.[10]

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Received: January 24th, 2022 Accepted: November 26th, 2022

External oblique ridge fixation via introral approach alone (champy's technique) has certain downsides, according to Kroon et al, including lower border opening, lateral fragment displacements, infection, and malocclusion as a result of placing single miniplate along line of zero force.[11]

There are various advantages to using a combined technique with a single transbuccal plate (intraoral and transbuccal method) rather than an intraoral approach alone. It only requires minor bending for adaption, and a single plate can be inserted slightly deeper into the soft tissue.The best way to treat mandibular angle fractures is still up for debate.[12] The goal of this study was to examine two alternative treatment techniques for mandibular angle fractures intraorally and identify which one was the best in terms of postoperative problems, resulting in improved patient care.

MATERIAL AND METHODS

This randomized control trial was performed in the Department of Oral and Maxillofacial Surgery, Punjab Dental Hospital, for a period of six months (01/07/2017 to 31/12/ 2017). The appropriate approval was received from the same institutional ethical review committee. The WHO calculator was used to compute 160 individuals (80 in each group) with 80% power of test, 5% level of significance taking expected percentage of malocclusion i.e. 10% assumed in intraoral group versus 1% in intraoral with transbuccal approach for the management of mandibular angle fractures using single miniplate. Sampling was done using a non-probability consecutive sampling technique. All mandibular angle fracture patients aged 16 and up who presented within 14 days of the fracture were included in the study, but malunited/nonunited, pathological, Comminuted, and panfacial fractures were excluded. The severity of fractures was determined based on the patient's medical history, clinical examination, and radiography (Orthopantogram and posteroanterior mandible).

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The study, as well as the research procedure and risk-benefit ratio, was explained to the patient, and informed consent was taken (from the patient/ parents/attendants) on the structured Performa, demographic information such as name, age, gender, and contact information was captured. Patients were allocated into two groups, each with 80 patients. Allocation to the treatment has been performed by non-clinical staff through a blind technique by sealed envelopes that were opened on the day of surgery.. Patients in group A had a single mini plate inserted at the superior border via intraoral incision(In this approach a single miniplate was placed on the ventral surface of mandible parallel to the oblique line through an intraoral incision), while patients in group B had a mini plate implanted at the lateral border of the mandibular angle at the center point via intraoral incision and secured using a transbuccal approach(In this approach a single miniplate was placed on the lateral surface of the angle via a combined oral and transbuccal incision).[10]

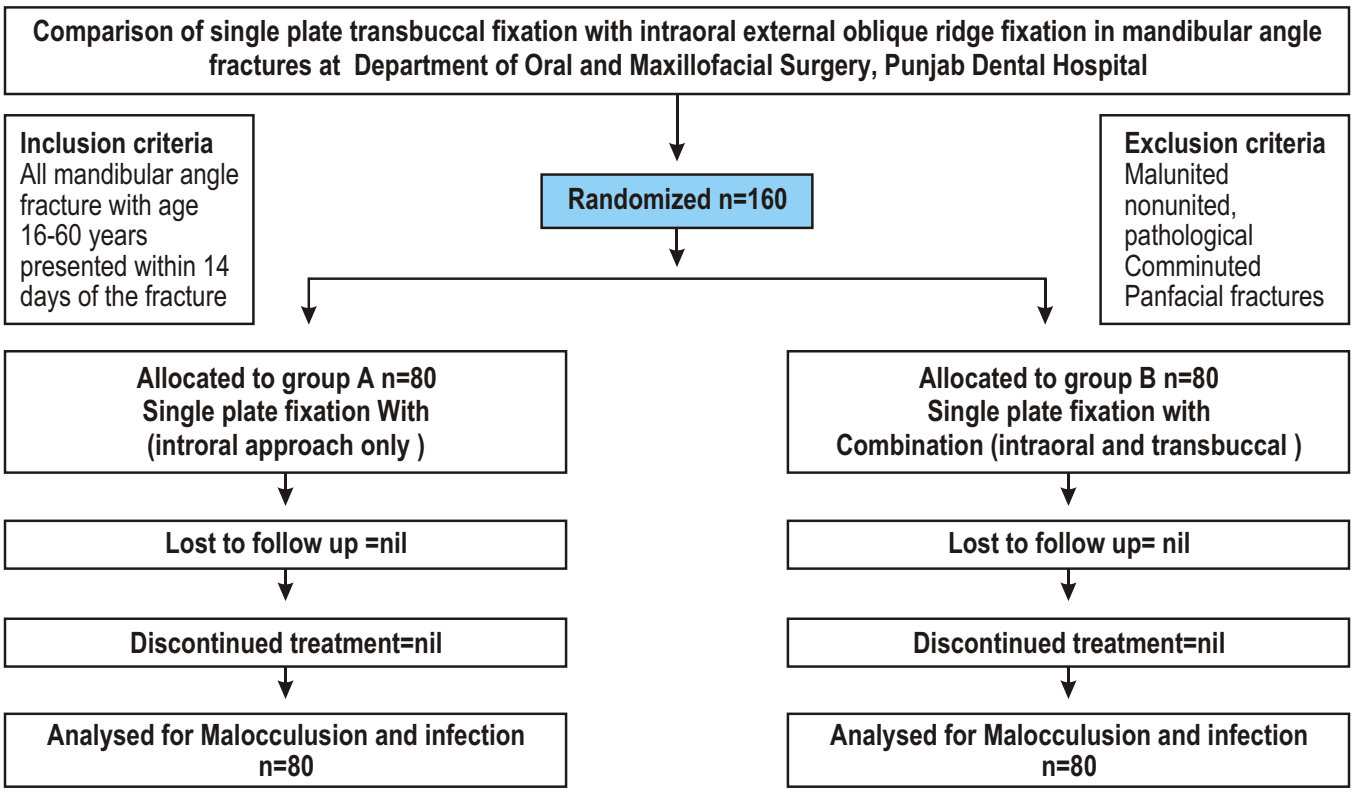
Under general anesthesia, all fractures were repaired with open reduction (ORIF). A single team of surgeons (consisting of consultant maxillofacial surgeon and 3rd and 4th year postgraduate trainee) performed all of the procedures. Only during the surgical time were eyelet wiring of the upper and lower jaws with 0.75 gauge stainless steel wire, Arch bars, and IMF screws utilized to accomplish occlusion and intermaxillary fixation. Fractures in Group A were exposed, reduced, and fixed using simply an intraoral buccal vestibular incision and external oblique ridge fixation, whereas fractures in Group B were treated using a mixed method (introral with transbuccal approach and fixation with a lateral cortical plate).

In Group A, the fracture site was approximated and a 05 hole miniplate with two screws at each side of the fracture line at the external oblique ridge at the champy line was used, whereas in Group B, the lateral cortical fixation was a bit deeper to avoid its superficial placement. All patients were admitted to the hospital for two days and were given broad-spectrum antibiotics for one week. On the first day and first week after surgery, radiographs were recommended. Patients were encouraged to follow a semi-liquid diet and follow rigorous oral hygiene guidelines. Patients were discharged on the third day and recalled for

follow-up in the first week, followed by weekly follow-up visits for one month, then monthly visits for up to three months by the researcher himself for assessment of infection and lip malocclusion (as defined by the operational definitions) and recorded on the Performa.

All data was entered into the Statistical Package for Social Sciences (SPSS) version 16.0 and the findings were analyzed as follows. The frequency and percentages are reported for categorical characteristics such as sex and surgical complications such as infection and malocclusion. For quantitative variables like age, the mean and SD were calculated. The 'Chi square' test was used to compare infection and malocclusion. A p-value of less than or equal to 0.05 was deemed significant in both groups.

CONSORT FLOW CHART



RESULTS

The mean age of these patients was 24.79 years (SD± 6.855) with an age range from 16- 60 years. In group A mean age was 24.38 (±7.356) with an age range from 16-60 years whereas in group mean age was 25.20 (±6.333) with an age range from 16-41. Males formed the predominant gender 70% (n=112) involvement whereas females constituted 30% (n=48). In Group A males formed the predominant gender 65% (n=52) whereas there were 35% females (n=35). In group B male gender was predominant 75% (n=60) whereas females comprised the remainder 25% (n=20). Peak incidence was noted from 1640 year age group, these observations.

Overall the left side was more often fractured with 88(55%) patients presenting with mandibular angle fractures as compared to the right side with 72(45%) patients presenting with mandibular angle fractures. In group A 32 (40%) fractures were seen on the right side out of which 17 were male and 15 were females whereas 48(60%) fractures were seen on the left side, 35 males and 13 females. In group B sidewise distribution of patients was equal, in group B 40(50%) fractures were seen on the right side among which 28 were males and 12 were females whereas 40(50) fractures were seen on the left side, 32 males and 08 females.

In group A 12(15%) patients suffered from infection and in group B 7(8.75%) of patients reported with infection at the last follow up visit that is at the end of 3 months (table no 1). The overall infection rate taking both groups into account was19 patients with overall percentage of

11.875%. In group A 2(2.5%) patients showed malocclusion and in group B 1(1.25%) of patients reported with malocclusion at the last follow up visit that is at the end of 3 months. The overall malocclusion rate taking both groups into account was three patients with overall percentage of 1.875%. (Table no 3). P-value was insignificant for infection and malocclusion at third month after application of `Chi square test.

Table 01. Infection in Both Groups

	First Week		First Month		Third Month	
	Right	Left	Right	Left	Right	Left
Group A	4	3	7	7	7	5
Group B	1	3	6	3	7	0

Table 02. Summary of Infection in Both Groups A & B with Corresponding P-value

	Group A		Group B		X2	P
	Infection	Not Infection	Infection	Not Infection		
First Week	7	73	4	76	0.879	0.349
First Month	14	66	9	71	-1.269	0.260
Third Month	12	68	7	73	1.493	0.222

Table 03. Malocclusion in Both Groups

	First Week		First Month		Third Month	
	Right	Left	Right	Left	Right	Left
Group A	1	2	2	1	1	1
Group B	0	0	1	1	0	1

Table 04. Summary of Malocclusion in Both Groups A & B with Corresponding P-value

	Group A		Group B		X2	P
	Yes	No	Yes	No		
First Week	3	77	0	80	3.057	0.080
First Month	3	77	2	78	0.206	0.650
Third Month	2	78	1	79	0.340	0.560

DISCUSSION

This study mean age 24.79 years (SD ± 6.855), while it was 27.9 in a prospective study by Edward Ellis, 22.4 in a retrospective study by Barry et al, 31.1 (SD ± 12.6) years in Hofer's study.[11,13] Similarly, Ogundare et al in their study concluded that this age group is the most active subgroup in the society and therefore it is more exposed to trauma resulting from road traffic accidents and falls.[14]

The common cause of mandibular fractures is road traffic accidents as overwhelming workload in our society is on the male population which requires them to travel on daily basis making them susceptible to these kinds of injuries as apparent by our study results male 70% (n=112) males versus female 30% (n=48%). Similar to our study, Hofer's et al study shows 86.7% (n=52) males and 13.3% (n=8) females.[13] Valdisalv's et al in his study recorded a percentage of 86% males and 14%

females.[14] Patil had 80% (n=60) males and 20% (n=15) females in his study.[15]

The left sided angle fractures were more (55%) than the right sided ones (45%) in our study. Albert's et al study shows of 63.2% right angle fractures versus 30.9% left angle fractures.[16] Bui et al reported results similar to our study with 59% of the fractures on the left side and 33 % on the right side.[17]

Complication rates in mandibular angle fracture ranges from 0-32%.[5,6] In a study conducted by Sugar et al comparing two methods intraoral alone versus intraoral with transbuccal approach reported infection rate of 14.28%. In Sugar's study, infection rate via intraoral oral approach in their study was 21% and 9% with intraoral & transbuccal approach while it was 15% and 8.75% in our study correspondingly. Factors like inclusion of multiple surgeons in Sugar study may have contributed for these significant differences.[12] Wan et al conducted a retrospective study on 597 patients in Western Australia comparing intraoral approach with transbuccal approach and the infection rate was found out to be 8.07% in transbuccal approach and 14.7 % in intraoral group which is comparable to our study.[18]

Danda et al observed a less infection rate via intraoral approach (11.1%) however sample size in their study was very small (27 patients in one group).[6]In our study, 03 patients (1.87%) out of 160 developed malocclusion, with 02 (2.50%) developing malocclusion in group Aand 01 (1.25%) developing malocclusion in group B. Moreno et al in their study reported 3.44% total malocclusion rate. However Moreno et al compared four different techniques for managing mandibular angle fractures.[19] Schaaf et al found 7% (n=1) malocclusion in patients managed with intraoral technique, which is much higher than our findings.[20] Levy et al found that overall malocclusion was 1.96 %, which is similar to our findings. They found a malocclusion rate of 5.3 percent in the intraoral group, which is much higher than our findings.[21] Laverick et al compared intraoral with intraoral and transbuccal approaches and found no significant differences in malocclusion between the two groups.[22] Sugar et al. in their study found a 1.4% overall incidence of malocclusion. In the intraoral group, 2% malocclusion was reported, while in the intraoral with transbuccal approach, 1% malocclusion was recorded; the results of his study are equivalent to ours.[23]

In both groups, patients were examined for malocclusion at one week, one month, and three months after surgery. In the intraoral method, the rate of malocclusion was 3.75%, 3.75%, and 2.50%, respectively; similarly, in group B, the incidence of malocclusion was 0.0%, 2.50% and 1.25% after one week, one month, and three months. Sugar et al. reported malocclusion rates of 7%, 2%, and 2% in intraoral and intraoral with transbuccal approaches on the first week, first month, and third month, and 0.0%, 4%, and 1%, respectively, in the first week, first month, and third month. Malocclusion in both groups peaks during first month and then shows a decline favoring our study. This drop in malocclusion may due to reason that small occlusal discrepancies are corrected by dental compensation.[23] Direct comparisons of different studies is not possible because there are fewer studies in which information is collected in a similar manner.

CONCLUSION

The most frequent facial fractures and those with the highest rates of complications are mandibular angle fractures. No statistically significant p value was found for the connection of infection and malocclusion with either an intraoral or an intraoral and transbuccal technique during the course of this investigation. The main results of this study indicate that compared to a transoral approach, using an intraoral and transbuccal procedure results in less postoperative problems. Because fewer patients will need additional treatments to manage complications and using the transbuccal procedure doesn't cost surgeons anything, a practical effect is that the health system will save money.

Limitation

There are certain limitations of this study. Fractured teeth were not excluded from the study e.g the presence of a third molar. Similarly conditions like apical periodontitis, mobility, dislocated teeth and deep cavities, pre-extractions have impact on results of fracture treatment by increasing the risk of problems. These factors were not excluded. The danger of infection during the postoperative phase is extremely high in smokers. More research is needed in this area before precise guidelines for the treatment of mandibular angle fractures can be established.

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DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CONFLICT OF INTEREST: Authors declared no conflict of interest.
GRANTED SUPPORT AND FINANCIAL DISCLOSURE: Nil

AUTHOR'S CONTRIBUTION

The following authors full fill authorship criteria as per ICMJE guidelines;

Tayyab TF, Jamal M:	Idea conception, data acquisition, final approval, agreed to be accountable for all the work.
Qayyum Z, Amin S:	Design of the work, drafting the work, critical rivision, final approval, agreed to be accountable for all the work.
Riaz S:	Data analysis, drafting of the work, final approval, agreed to be accountable for all the work.
Perveen A:	Data interpretation, critical revision, final approval, agreed to be accountable for all the work.